From:	BAYUK Dana
To:	"John Edwards"
Cc:	"Ben Hung"; "Ben Johnson"; Scott Coffey; LARSEN Henning; "Ilene Munk Gaekwad (imunk@foleymansfield.com)"; "Jen Mott"; "James Peale"; "John Renda"; "Katie Atkins"; "Kelly Titkemeier (ktitkemeier@maulfoster.com)"; "Mary Benzinger (mbenzinger@maulfoster.com)"; "Mike Murray"; "Madi Novak"; "Mike Riley"; "Matt Wilson"; "Myron Burr (myron.burr@siltronic.com)"; Miao Zhang; "Patty Dost"; "Lance Peterson (petersonle@cdmsmith.com)"; "Pradeep Mugunthan"; "Bob Wyatt"; "Rob Ede"; "Rana Uhl"; Sheldrake, Sean
Subject:	RE: NW Natural, November 2015 through February 2016 H&C System Hydraulic Data - Evaluation of Transducer Drift and Calibration Data Report
Date:	Wednesday, December 07, 2016 4:53:56 PM

Good afternoon John.

This e-mail summarizes DEQ's understanding of Monday's (12/5) discussions regarding our November 23, 2016 e-mail (see below). As you know, manual water level measurements are being used to check the accuracy of the HC&C system transducer data. The December 5th meeting focused on potential errors associated with manual water level measurements and developing an approach to increase the reliability and accuracy of manual measurements going forward.

Based on the meeting, DEQ understands the following:

- NW Natural will conduct manual water level measurements for 3-months at the locations and according to the frequency indicated in our November 23rd e-mail.
- Prior to implementing manual measurements under the modified schedule, NW Natural will recommend a detailed step-by-step protocol for making water level measurements that serves as a reliable independent check on transducer data.
- NW Natural will assess and propose methods to check the accuracy of transducers during the 3-month period (e.g., co-locating a 15-psi transducer with a 30-psi transducer in select locations).
- The differences between manual measurements and corresponding transducer data recorded during the 3-month period will be used by NW Natural to further evaluate the potential error associated with manual and transducer data.

As we discussed during the meeting, DEQ considers the primary purpose of the 3-month time period to be improving the accuracy and reliability of manual measurements as a check on transducer data. Our November 23rd e-mail determines that the performance criterion currently being used to verify that hydraulic control and containment is being achieved (i.e., ±0.05-feet), should be increased to ±0.1-feet. This determination is in effect. Beginning with December 2016, NW Natural should incorporate the criterion of ±0.1-feet into hydraulic data packages until DEQ approves an alternative.

Related to the HC&C system hydraulic data packages, John Renda and I spoke by phone this morning about submitting data collected since the end of the commissioning period. During call we agreed that data packages for the months of June 2016 through November 2016 will be provided on or before January 15, 2017. The December 2016 package will be provided by February 15, 2017.

Please feel free to contact me with questions regarding this e-mail.

Dana

Mr. Dana Bayuk
Cleanup Program Project Manager/Hydrogeologist
Oregon Department of Environmental Quality
Northwest Region
700 NE Multnomah Street, Suite 600
Portland, OR 97232-4100

E-mail: bayuk.dana@deq.state.or.us
Phone: 503-229-5543
FAX: 503-229-6945

Please visit our website at http://www.oregon.gov/DEQ/


please consider the environment before printing this email

From: BAYUK Dana
Sent: Wednesday, November 23, 2016 1:30 PM
To: John Edwards
Cc: Bob Wyatt; Patty Dost; Ben Hung; Pradeep Mugunthan; Mike Riley; Ben Johnson; Matt Wilson; Rob Ede; Sean Sheldrake; Lance Peterson (petersonle@cdmsmith.com); Scott Coffey <coffeyse@cdmsmith.com>; LARSEN Henning; John Renda; Rana Uhl; Katie Atkins; 'Jen Mott'; James Peale; Kelly Titkemeier (ktitkemeier@maulfoster.com); Madi Novak; Mary Benzinger (mbenzinger@maulfoster.com); 'Mike Murray'; Myron Burr (myron.burr@siltronic.com); Ilene Munk Gaekwad (imunk@foleymansfield.com)
Subject: RE: NW Natural, November 2015 through February 2016 H&C System Hydraulic Data - Evaluation of Transducer Drift and Calibration Data Report

Hello John.

DEQ reviewed the "Evaluation of Transducer Drift and Calibration Data, NW Natural Gasco Site" dated August 5, 2016 (Transducer Data Evaluation). The Transducer Data Evaluation presents NW Natural's evaluation of potential error associated with transducer data collected at monitoring wells and piezometers in the HC&C system monitoring network during the commissioning period (May 2015 through May 2016). Anchor QEA, LLC (Anchor) prepared the Transducer Data Evaluation for NW Natural.

The primary purpose of the Transducer Data Evaluation is to determine whether an adjustment should be made to the performance criterion being used to evaluate whether the HC&C system is achieving and maintaining hydraulic control and containment of groundwater in the Upper Alluvium WBZ, Lower Alluvium WBZ, and the Deep Lower Alluvium WBZ. The current performance criterion is to maintain water level elevations in monitoring wells and piezometers more than 0.05-feet below those of the Willamette River.

Differences between monthly manual water level measurements and transducer data form the basis of the evaluation. As indicated in the Transducer Data Evaluation, Anchor compiled and evaluated the differences by taking the arithmetic average of the monthly difference between manual measurements and transducer data for each location. Using this approach Anchor concludes the current criterion of 0.05-feet does not need adjustment.

DEQ further evaluated the water level data differences compiled by Anchor (see table attached). Based on our review and analysis of the data, DEQ does not approve the Transducer Data Evaluation. Our review and analysis determined the following:

- Conclusions regarding the error between manual measurements and transducer data should be based on the average sum of the total absolute error associated with groundwater and river stage water level measurements.
- Using the average sum of the total absolute error, the performance criterion for determining hydraulic control and containment should be increased from 0.05-feet to 0.1-feet (i.e., the water level elevations in each monitoring well and piezometer should be a minimum of 0.1-feet lower than the river to account for total absolute error).
- The highest priority measuring points for checking, confirming, and maintaining data accuracy include (in order of importance):
    - The two transducers in the river as they are the basis for HC&C system operations overall and measurement errors here are propagated throughout water level monitoring network;
    - All control wells given measurement errors influence the capacity of the HC&C system to achieve and/or maintain hydraulic control and containment in the vicinity of nearby extraction wells;
    - Monitoring well and piezometer locations that do not consistently meet the revised criterion of 0.1-feet (see red-highlighted locations in the "Avg. Sum Error" column of the attachment) and/or installations of important to evaluating HC&C system performance (e.g., Deep Lower Alluvium WBZ monitoring wells, WS-8-59, WS-12-125).
- Monthly manual water level measurements are inadequate to monitor, evaluate, and/or rectify in a timely manner, errors between transducer and manual measurements. Consequently, for at least three consecutive months NW Natural should increase the frequency of manual measurements as follows:
    - Twice per week (semi-weekly) at both river stilling wells;
    - Weekly at all control wells; and
    - Every other week (bi-weekly) at all installations that do not consistently meet the performance criterion of 0.1-feet.

Regarding the remaining monitoring wells and piezometers in the network, NW Natural should continue measuring water levels monthly.

DEQ also recommends that the procedures being used to collect manual measurements be reviewed and modified to ensure data accuracy. Some of these best practice procedures include, but are not limited to:

- Synchronizing the field time when manual water level measurements are made with the transducer clock and/or PLC;
- Noting, recording, and using consistent water level meter sensitivity settings (many water level probes have this setting) when collecting the synoptic manual water level measurements; and
- Collecting and recording duplicate water level measurements at each sensor location to ensure measurements are consistent, or not being influenced by external factors.

The water level data collected according to this e-mail will be used to further evaluate differences between manual and transducer measurements and make adjustments to the water level monitoring program if appropriate. Furthermore, the revised protocols for measuring groundwater and river water levels should be fully incorporated into the HC&C system performance monitoring plan.

Please feel to contact me if you have questions or would like to arrange a date and time if you'd like to discuss this e-mail and the attachment.

Dana

Mr. Dana Bayuk
Cleanup Program Project Manager/Hydrogeologist
Oregon Department of Environmental Quality
Northwest Region
700 NE Multnomah Street, Suite 600
Portland, OR 97232-4100

E-mail: bayuk.dana@deq.state.or.us
Phone: 503-229-5543
FAX: 503-229-6945

Please visit our website at http://www.oregon.gov/DEQ/


please consider the environment before printing this email

-----Original Message-----
From: Jen Mott [mailto:jmott@anchorqea.com]
Sent: Friday, August 05, 2016 7:06 AM
To: BAYUK Dana
Cc: Bob Wyatt; Patty Dost; Ben Hung; John Edwards; Pradeep Mugunthan; Mike Riley; Ben Johnson; Matt Wilson; Rob Ede; Sean Sheldrake; Lance Peterson (petersonle@cdmsmith.com); Scott Coffey <coffeyse@cdmsmith.com>; LARSEN Henning; John Renda; Jen Mott; Rana Uhl; Katie Atkins; James Peale; Kelly Titkemeier (ktitkemeier@maulfoster.com); Madi Novak; Mary Benzinger (mbenzinger@maulfoster.com); 'Mike Murray'; Myron Burr (myron.burr@siltronic.com); Ilene Munk Gaekwad (imunk@foleymansfield.com)
Subject: RE: NW Natural, November 2015 through February 2016 H&C System Hydraulic Data - Evaluation of Transducer Drift and Calibration Data Report

Dana,

The attached report, Evaluation of Transducer Drift and Calibration Data, was prepared in response to your June 3, 2016 email request for NW Natural to further evaluate the potential for transducer drift to influence data collection and use.

Please contact John Edwards with any questions or to discuss the report.

Thank you,
Jen Mott ☺

Anchor QEA, LLC
jmott@anchorqea.com
421 SW Sixth Avenue, Suite 750
Portland, OR 97204
503-972-5014

-----Original Message-----
From: BAYUK Dana [mailto:BAYUK.Dana@deq.state.or.us]
Sent: Friday, June 03, 2016 4:34 PM
To: John Renda <jrenda@anchorqea.com>
Cc: Bob Wyatt <rjw@nwnatural.com>; Patty Dost <pdost@pearllegalgroup.com>; Ben Hung <bhung@anchorqea.com>; John Edwards <jedwards@anchorqea.com>; Pradeep Mugunthan <pmugunthan@anchorqea.com>; Mike Riley <mriley@anchorqea.com>; Jen Mott <jmott@anchorqea.com>; Ben Johnson <bjohnson@anchorqea.com>; Matt Wilson <mwilson@anchorqea.com>; Rob Ede <robe@hahnenv.com>; Myron Burr (Myron.Burr@siltronic.com) <Myron.Burr@siltronic.com>; Ilene M. Munk (imunk@foleymansfield.com) <imunk@foleymansfield.com>; Madi Novak (mnovak@maulfoster.com) <mnovak@maulfoster.com>; James Peale (jpeale@maulfoster.com) <jpeale@maulfoster.com>; Mike Murray <mmurray@maulfoster.com>; Sean Sheldrake <sheldrake.sean@epa.gov>; Lance Peterson (petersonle@cdmsmith.com) <petersonle@cdmsmith.com>; Scott Coffey <coffeyse@cdmsmith.com> <CoffeySE@cdmsmith.com>; LARSEN Henning <LARSEN.Henning@deq.state.or.us>
Subject: NW Natural, November 2015 through February 2016 H&C System Hydraulic Data

Good afternoon John.

DEQ reviewed the HC&C system hydraulic data packages for the months of November 2015 through February 2016. Anchor QEA, LLC prepared the four monthly data packages for NW Natural and made the data available for DEQ and EPA to download from Anchor's FTP site, or transmitted the data via e-mail.

This e-mail provides our comments on the hydraulic data packages, and acknowledges that the compilation, presentation, and reporting of these data packages were completed consistent with the schedule DEQ approved by e-mail on October 6, 2015. Besides DEQ, EPA reviewed the HC&C system hydraulic data packages. EPA's comments have been incorporated into the attachment.

For clarification, the comments provided in this e-mail supplement DEQ and EPA comments e-mailed on February 25, 2016. Besides providing DEQ/EPA observations on HC&C system performance, the February 25th comments identified the need for NW Natural to further evaluate the potential for transducer drift to influence data collection and use. NW Natural, Siltronic, EPA, and DEQ discussed transducer drift during a conference call on April 28, 2016. DEQ currently understands that NW Natural is developing a technical approach for further analyzing the potential for transducer drift to influence hydraulic data presentations and interpretations, as well as NW Natural's conclusions regarding HC&C system performance.

Except as indicated in the attachment, DEQ is not requesting NW Natural to provide written responses to the comments. The comments provide our observations regarding hydraulic data and data trends, and are for NW Natural's information, consideration, and use in monitoring the performance and operation of the HC&C system, and for future reporting.

DEQ acknowledges and appreciates NW Natural monthly compilation and preparation of the HC&C system hydraulic data packages.

Hope you have a good weekend and please feel free to contact me with questions regarding this e-mail.

Dana

Mr. Dana Bayuk
Cleanup Program Project Manager/Hydrogeologist Oregon Department of Environmental Quality Northwest Region
700 NE Multnomah Street, Suite 600
Portland, OR 97232-4100

E-mail:
bayuk.dana@deq.state.or.us<https://deqmail.deq.state.or.us/owa/redir.aspx?C=xpW59Hf5PUaZQh14CmQiIBhMMhcOKtAICv8HjAWBmf41qjKlUXf-S2Jkwgyvoh92WdxoWiGazVI.&URL=mailto%3abayuk.dana%40deq.state.or.us>
Phone: 503-229-5543
FAX: 503-229-6899

Please visit our website at
http://www.oregon.gov/DEQ/<https://deqmail.deq.state.or.us/owa/redir.aspx?C=xpW59Hf5PUaZQh14CmQiIBhMMhcOKtAICv8HjAWBmf41qjKlUXf-S2Jkwgyvoh92WdxoWiGazVI.&URL=http%3a%2f%2fwww.oregon.gov%2fDEQ%2f>